Isolation and screening of yeast strains possessing synthetic dye decolorizing activity

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Synthetic dyes are organic compounds that have been extensively used for textile dyeing and paper printing, as well as additives in petroleum, pharmaceutical and cosmetic products. However, owing to their aromatic and heterocyclic moieties, synthetic dyes are often highly recalcitrant and some are even toxic and mutagenic. Because of their resistance to microbial degradation, dyes can cause considerable environmental pollution, so their removal has received considerable attention.

Many microorganisms have been found to be capable of degrading dyes; these include bacteria, filamentous fungi, yeasts, actinomycetes and algae.

White rot fungi, in particular, are able to transform (and even mineralize) some dyes, based on their extracellular, non-specific and non-stereoselective enzyme systems. Involvement of ligninolytic peroxidases (viz. Versatile, MnP and LiP), besides laccases, has been demonstrated in the degradation pathways of some of those dyes. However, filamentous fungi are poorly adapted to a continuous wastewater treatment unit, due to their low rates of growth, coupled with a filamentous exuberant mycelium. Yeasts possess the advantage of growing faster than filamentous fungi, and can in addition resist to unfavorable environments. However, degradation of synthetic dyes by yeasts has not been extensively reported to date.

Reporting this communication, the process of isolation of wild yeasts from wastewater treatment plants, and subsequent screening (along with other 81 cheese isolates), for the ability of decolorizing textile dyes is reported — covering solid media. Three isolates were further tested for dye decolorization in liquid cultures. In liquid culture the yeast isolate LIIIS36 exhibited a high efficiency of decolorization in the case of two of the dyes tested (Levafix Red CA and Levafix Yellow CA). The observation of colorless yeast cells might unfold the existence of an underlying biodegradation mechanism.

The possibility to decolorize more than one dye simultaneously with the same strain (LIIIS36), and the fact that the maximum decolorization extent is reached in a mere 24—36 hours of incubation, are clues for its potential as part of future bioremediation strategies.